

invoke a camera function of the user device and allow the user to take photos or videos, or uploading photos or videos obtained elsewhere. A user may choose to use an onboard camera of the mobile device to capture a facial image using a front-facing camera **504** or a rear-facing camera **505**. The interface may also include a marked area **501** to help the user to locate the face of the subject in a designated area of the interface **500** to ensure a good quality of the captured facial images. In some embodiments, the system may allow the user to upload a photo or a video (**502**). The photo or video may be retrieved from a photo/video gallery or library of the user device.

**[0053]** In some embodiments, the system may preprocess an image of the subject by the user device or by a camera. The term “image” or “images,” as used herein, refers to single or multiple frames of still or animated images, video clips, video streams, etc. Preprocessing may include detecting a facial image in the image of the subject by the user device. Preprocessing may also include cropping, resizing, gradation conversion, median filtering, histogram equalization, or size normalized image processing.

**[0054]** In some embodiments, the system may resize the photo or the videos according to a threshold value (e.g., maximum size in kilobytes, megabytes or gigabytes, maximum or minimum resolution in dots per inch (DPI) or pixels per inch (PPI)). In some embodiments, the system may resize the photo or the videos based on the transmission rate of the network and the links.

**[0055]** In some embodiments, the system may perform additional processing steps by cameras, user devices, or server devices, to the captured images or videos to digitalize the data file and optionally compress into a convenient compressed file format, and sent to a network protocol stack for subsequent conveyance over a local or wide area network. Typical compression schemes include MPEG, JPEG, H.261 or H.263, wavelet, or a variety of proprietary compression schemes. A typical network topology is the popular Ethernet standard, IEEE 802.3, and may operate at speeds from 10 Mb/s to 100 Mb/s. Network protocols are typically TCP/IP, UDP/IP, and may be Unicast or Multicast as dictated by the system requirements.

### C. Facial Images Databases

**[0056]** The system may include one or more databases or database interfaces to facilitate communication with and searching of databases. For example, the system may include an image database that contains images or image data for one or more people. The system may also include a database interface that may be used to access image data of third parties (e.g., law enforcement, DMV) as part of the identity match process. Also part of the system is a personal data database that stores profile information of one or more people. The profile information may include at least one of: a name, a gender, a date of birth or age, a nationality, a correspondence language, a civic address, a phone number, an email address, an instant messaging identifier, and financial information. The profile information may also include a link to a webpage on a website containing the information related to a person of interest. For example, the website can be a social networking website, a professional networking website, a personal website, or an employer website. The system may include a privacy settings module that operates to establish a privacy setting for individuals to access a database.

**[0057]** The image database or the personal data database may be a relational, columnar, correlation, or other suitable databases. The databases can be local or distributed. For example, In some embodiments, the databases can be hosted on by a cloud service provider (e.g., Amazon AWS, Google Cloud, Microsoft Azure). Although this disclosure describes or illustrates particular types of databases, this disclosure contemplates any suitable types of databases.

**[0058]** FIG. 6 shows an example process for the system to acquire facial images and other related information of a person from the Internet using, for example, a web crawler. Much of the information about an identified individual can be obtained through public means and scanning social networking websites, such as Facebook and Google+, or professional networking websites, such as LinkedIn. Online photos associated with a person’s account may help to create additional records of facial recognition data points. In some embodiments, the system may (i) download by a web crawler facial images of individuals and personal information associated therewith; and (2) store the downloaded facial images and associated personal information in the database. In some embodiments, the reference facial recognition data comprise the facial images downloaded by the web crawler. The reference facial recognition data may include the facial images obtained from the Internet, professional websites, law enforcement websites, or departments of motor vehicles. In some embodiments, the database comprises a plurality of criminal records associated with the facial images stored in the database.

**[0059]** After downloading and storing the facial images, the system may classify the images based on one or more criteria. Thus, the database may also store the image information, including at least one of already classified images, network locations of already classified images, and documents containing classified images. For example, the image information includes web URLs or pointers to database entries of the unclassified images or already classified images, as well as locations of documents related to the images. The database can also be searched to locate images matching an input query. The query can include an image, or text specifying a search topic or category, and may further include a semantic query. A combination of image and text data can also be used as a query.

**[0060]** The database may not contain any images at all, but may instead contain digital image classification information and the network addresses of digital images and documents containing the digital images. In general, the database contains pointers to externally stored, pre-classified digital images, and related documents. The database itself may be local or remote, and it could be distributed over a plurality of locations.

**[0061]** In some embodiments, the system may transform image data into characteristic vectors or multidimensional matrixes. Characteristic vectors or multidimensional matrixes include the important features of a facial structure. In some embodiments, the database may only store the transformed facial image data (or vectorized facial image data), such that original facial images are not accessible without an operation to inverse the transformed images. In some embodiments, the system may apply encryption to original image data or transformed image data.

**[0062]** The images stored in or referenced by the database may be obtained at least in part through the Internet, such as by the activity of an automated web crawler. In one embodi-